New Dyna-Purge® E_2 vs. other commercial purging products

Performance test results comparing commercial purging products:

- New Dyna-Purge E_2 (Mechanical / Non-Abrasive)
- Mechanical (Abrasive) Purging Compound
- Chemical Purging Compound

Conducted by The Institute of Polymer Science and Polymer Engineering
at The University of Akron in Akron, Ohio.

Commissioned by Shuman Plastics, Inc., Dyna-Purge® Division, Depew, New York

Comparative Testing with Dyna-Purge E2

Processing information for New Dyna-Purge E2

Applications	**Injection molding, extrusion, and compounding**
Temperature range	**575°F - 715°F (302°C - 379°C)**
Types of resins	**High-temperature engineering resins**
Minimum clearance	**None**
Amount needed	**Approximately 1 to 2 times barrel capacity**

Abstract

The Institute of Polymer Science and Polymer Engineering at the University of Akron conducted an extensive independent study in November 2011. The study was commissioned by the Dyna-Purge® division of Shuman Plastics, Inc. to compare commercial purging products used for purging high-temperature resins. The independent study was overseen by Dr. Mark Holtman, Assistant to the Director at The Institute of Polymer Science and Polymer Engineering, University of Akron. All trials were conducted on a 55 ton Van Dorn injection molding machine using 3 different resins: PSU, PEI and PPA.

Types of Commercial Purging Products Used

New Dyna-Purge E2 (Mechanical / Non-abrasive): Delivers the most advanced technology breakthrough in heat stability and enhanced cleaning. Its unique integrated polymer system was developed for purging high-temperature resins safely and efficiently in all areas of the machine, including tight channels.

Mechanical (Abrasive): A highly glass filled (approx. 50%) polycarbonate-based resin. The compound functions as a mechanical agent with the base resin melting and the glass filler abrasively cleaning the surface of the screw and walls of the processing equipment. However, at higher temperatures, polycarbonate can become "fluid" and soften to the point where it becomes less effective at displacing the resident resin. Furthermore, glass filled purging compounds cannot be used in hot runners and frequent use in the machine may cause pitting and excessive wear.

Chemical: A polyolefin compound with chemical additives, including inorganic and inert salts. The chemical ingredients work by breaking down the polymer of the resident resin. However, it requires accommodations, including raising of the machine temperature and in some cases a soaking phase. The compound is also susceptible to degradation and is less effective in removing carbon build-up.

Processing Resins

• **Polysulfone (PSU) –**	Processing temperature: 650° F (343° C)
• **Polyetherimide (PEI) –**	10% glass filled. Processing temperature: 690° F (365° C)
• **Polyphthalamide (PPA) –**	65% glass / mineral filled. Processing temperature: 610° F (321° C)
• **Post purge resin –**	Fractional melt HDPE natural

Trial Protocol

1. Set temperature to appropriate level and clean hopper
2. Introduce .33 pounds (150 grams) of black engineering resin, starve the screw
3. Clean hopper
4. Add 2 pounds (908 grams) of commercial purging compound
5. Set shot size at 50% and purge until compound is consumed; place purge piles in cold water to solidify
6. Clean hopper
7. Introduce .50 pounds (227 grams) of natural fractional melt HDPE, starve the screw

Evaluation Criteria

In an effort to control the variables and validate the results, each of three commercial purging compounds followed the same trial protocol. Upon completion of each trial, the inspectors reviewed the HDPE assigning a "Pass" or "Fail" rating based on the presence of contamination and the degree of visual clarity.

Trial 1: Polysulfone (PSU)

Processing Temperature: 650° F (343° C)

No.	Purge	Rating	Comments
1	Mechanical (abrasive)	Fail	After 2 lbs. of purge, black PSU was still present.
2	Chemical	Fail	After 2 lbs. of purge, a significant amount of black PSU was still present and purge compound showed degradation.
3	New Dyna-Purge® E2 (mechanical / non-abrasive)	Pass	After 2 lbs. of purge, both the purge compound and post purge resins were clean and free of contamination.

Shows Mechanical, Chemical and Dyna-Purge E2

Results: Only New Dyna-Purge® E2 received a "Pass" rating.

Trial 2: Polyetherimide (PEI)

Processing Temperature: 690° F (365° C)

No.	Purge	Rating	Comments
1	Mechanical (abrasive)	Fail	After 2 lbs. of purge, black PEI was still present.
2	Chemical	Fail	After 2 lbs. of purge, a significant amount of PEI was still present and purge compound showed degradation.
3	New Dyna-Purge® E2 (mechanical / non-abrasive)	Pass	After 2 lbs. of purge, both the purge compound and post purge resins were clean and free of contamination.

Shows Mechanical, Chemical and Dyna-Purge E2

Results: Only New Dyna-Purge® E2 received a "Pass" rating.

Trial 3: Polyphthalamide (PPA)

Processing Temperature: 610° F (321° C)

No.	Purge	Rating	Comments
1	Mechanical (abrasive)	Fail	After 2 lbs. of purge, black PPA was present.
2	Chemical	Fail	After 2 lbs. of purge, traces of black PPA were still present and purge compound showed degradation.
3	New Dyna-Purge® E2 (mechanical / non-abrasive)	Pass	After 2 lbs. of purge, both the purge compound and post purge resins were clean and free of contamination.

Shows Mechanical, Chemical and Dyna-Purge E2

Results: Only New Dyna-Purge® E2 received a "Pass" rating.

The Institute of Polymer Science and Polymer Engineering at the University of Akron provides research support and technical service for the graduate research programs in the Department of Polymer Science and the Department of Polymer Engineering. The university's tradition as a leader in polymer science and polymer engineering began over 100 years ago with the foresight of a faculty member. Since then, Akron and the surrounding area have become known as the "Polymer Valley." In 1988 both the Polymer Science and Polymer Engineering departments were combined, creating the largest program of its kind, partially under the auspices of "The Institute of Polymer Science and Polymer Engineering."

Recognized as a world leader, the faculty members have generated over 160 active patents and have licensed technologies that have been commercialized worldwide. The Institute of Polymer Science and Polymer Engineering at the University of Akron conducts its research on thermoplastics in the "Sidney L. Olson Research Center," a 70,000 sq. ft. facility that includes advanced laboratories for injection molding, extrusion, compounding, blown film and blow molding.

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Study commissioned for use by:

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